

Appendix E

Outline for Example Stormwater Site Plan

In general, the following type of information should be included in a stormwater site plan. Consult the local permitting authority before preparing the plan to make sure it is necessary in the project site area, and also to determine if only certain elements of the plan are required.

- I. Project overview (brief description)
- II. A conceptual site plan, including:
 - locations of structures, other impervious surfaces
 - lot layout
 - setback requirements
 - existing site features (topography, contours)
 - water quality sensitive areas
 - road rights-of-way and easements

Table E-1 is a list of standard map symbols for use with the Catalog.

- III. Preliminary conditions summary, including soil types and depth to high groundwater (see Appendix B for directions on how to collect this information)
- IV. Off-site analysis - analysis of off-site upstream and downstream conditions, including capacity of the downstream system
- V. Identification of adjacent land uses and environmentally sensitive areas
- VI. Hydrologic calculations
- VII. A site plan for design and placement of proposed construction BMPs, including erosion controls (construction BMP plan)
- VIII. Design and placement of proposed permanent stormwater BMPs (include preliminary sizing calculations)
- IX. Operations and maintenance plan for the temporary and permanent stormwater BMPs
- X. List/description of other permits for the site (either issued or planned)

The Stormwater Site Plan (SSP) should be stamped and dated by a professional civil engineer licensed in the State of Idaho and then submitted to the appropriate reviewing agency.

Example Stormwater Site Plan

I. Project overview (brief description)

Construct a house of 1800 sq ft, attached garage of 400 sq ft, and a gravel driveway 250 feet long. The lot is 2.3 acres in size, located at 24040 Boot Hill Road in the Dodge Ranch Development. Since it is outside the sanitary service area, the house will be served by a septic system.

II. Site plan

Figure 1 shows the conceptual building plan including the lot layout, contour lines, building footprints, driveway alignment, property lines, county right of way, and location of nearby stream (sensitive waterway). The direction of surface water flow is also shown.

III. Preliminary conditions summary, including soil types and depth to high groundwater (see Appendix B for directions on how to collect this information)

The Soil Survey map from the Natural Resource Conservation Service shows that the soil type at the site is classified as Archibal Loam, a silty loam. Its hydrologic classification is Type B. A well log from an adjacent property showed a groundwater elevation of 5040 feet, so the depth to groundwater is assumed to range from 10 to 18 feet. For BMP selection, the minimum depth of 10 feet was used.

The 2-foot contour intervals were surveyed by the developer of this subdivision. The average slope is 2 feet vertical / 70 feet horizontal or about 3%.

IV. Off-site analysis - analysis of off-site upstream and downstream conditions, including capacity of the downstream system

Approximately 2 acres of undeveloped land lie upslope and appear to drain into this property. Flows from this upstream property were assumed to be insignificant and were not included in the calculations. Runoff from the 24040 Boot Hill Road lot enters a drainage ditch which leads to a culvert about 100 feet away. The culvert is 12 inches in diameter with a 2% slope. The capacity of the culvert is 2.3 cfs. (Calculated using an inlet control nomograph supplied by Idaho Transportation Dept.)

V. Identification of adjacent land uses and environmentally sensitive areas

The lot is situated in a development zoned for single family residential. About half of the lots are developed so far. The only environmentally sensitive area is a small stream that is located 200 feet downhill from the site.

VI. Hydrologic calculations

Hydrologic calculations are shown in the attached worksheets. The first set of worksheets show that the peak flow previous to development is 0.0072 cfs. The second set shows peak flows after development are projected to be 0.1 cfs, 14 times as great.

VII. Plan for design and placement of proposed construction BMPs

The Stormwater Site Plan, Figure 2, shows the placement of proposed construction BMPs. These include:

- preserve existing trees by establishing clearing limits to be marked before starting construction
- stabilize the slope with matting and seeding where it will be cut for the house
- realign driveway to lessen slope
- cover excavated topsoil until reuse
- stabilize construction entrance with gravel

VIII. Design and placement of proposed permanent stormwater BMPs

The first three BMPs listed above will remain in place as permanent BMPs after construction is finished.

IX. Operations and maintenance plan for the temporary and permanent stormwater BMPs

The only maintenance anticipated for the permanent BMPs is watering the seeded slope as necessary until the grass is re-established.

X. List/description of other permits for the site (either issued or planned)

A local building permit.

A septic permit from the local District Health Department.

Table E-1. Map Symbols




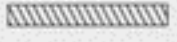












SYMBOL	FILE NAME	DESCRIPTION
	BMP3	Preservation of existing vegetation
	BMP4	Clearing limits
	BMP5a	Stabilization of construction entrance/roads/driveways
	BMP5b	Erosion prevention on temporary and private roads
	BMP6	Dust control
	BMP7	Cover for materials and equipment
	BMP8	Spill prevention and control
	BMP9	Vehicle/equipment washing and maintenance
	BMP11	Mulching
	BMP12	Hydromulching
	BMP13	Geotextile
	BMP14	Matting
	BMP15	Pipe slope drain
	BMP16	Slope roughening
	BMP17	Gradient terracing
	BMP18	Retaining wall

Table E-1. Map Symbols




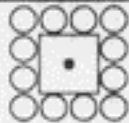

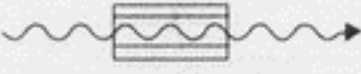
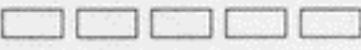
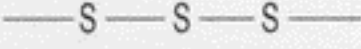
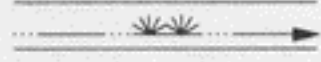


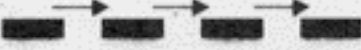
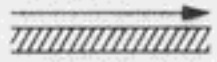

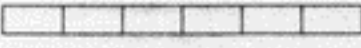

SYMBOL	FILE NAME	DESCRIPTION
	BMP19	Gabions
	BMP20a	Riprap slope protection
	BMP20b	Riprap outlet protection
	BMP21	Inlet protection
	BMP22	Check dams
	BMP23	Temporary stream crossing
	BMP24	Straw bales/biofilter bags
	BMP25	Silt fence
	BMP26	Vegetative buffer strip
	BMP27	Sediment trap (basin)
	BMP28	Portable sediment tank
	BMP29	Temporary swale
	BMP30	Earth dike
	BMP31	Perimeter dike/swale
	BMP32	Temporary berms (sandbags)
	BMP33	Temporary storm drain diversion

Table E-1. Map Symbols





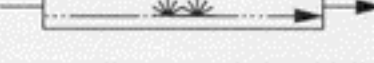


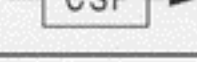








SYMBOL	FILE NAME	DESCRIPTION
	BMP34	Topsoiling
	BMP35	Seeding
	BMP36	Sodding
	BMP37	Planting
	BMP38	Vegetated swale
	BMP39	Vegetative filter strip
	BMP40	Sand filter
	BMP41	Compost stormwater filter
	BMP42	Catch basin insert
	BMP43	Infiltration trench
	BMP44	Infiltration basin
	BMP45	Wet pond (conventional control)
	BMP46	Wet pond (nutrient control)
	BMP47	Wet extended detention pond
	BMP48	Dry extended detention pond
	BMP49	Constructed wetland

Table E-1. Map Symbols



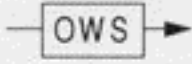
SYMBOL	FILE NAME	DESCRIPTION
	BMP50	Presettling/sedimentation basin
	BMP51	Wet vault/tank
	BMP52	Oil/water separator

Figure E-1. Conceptual Site Plan

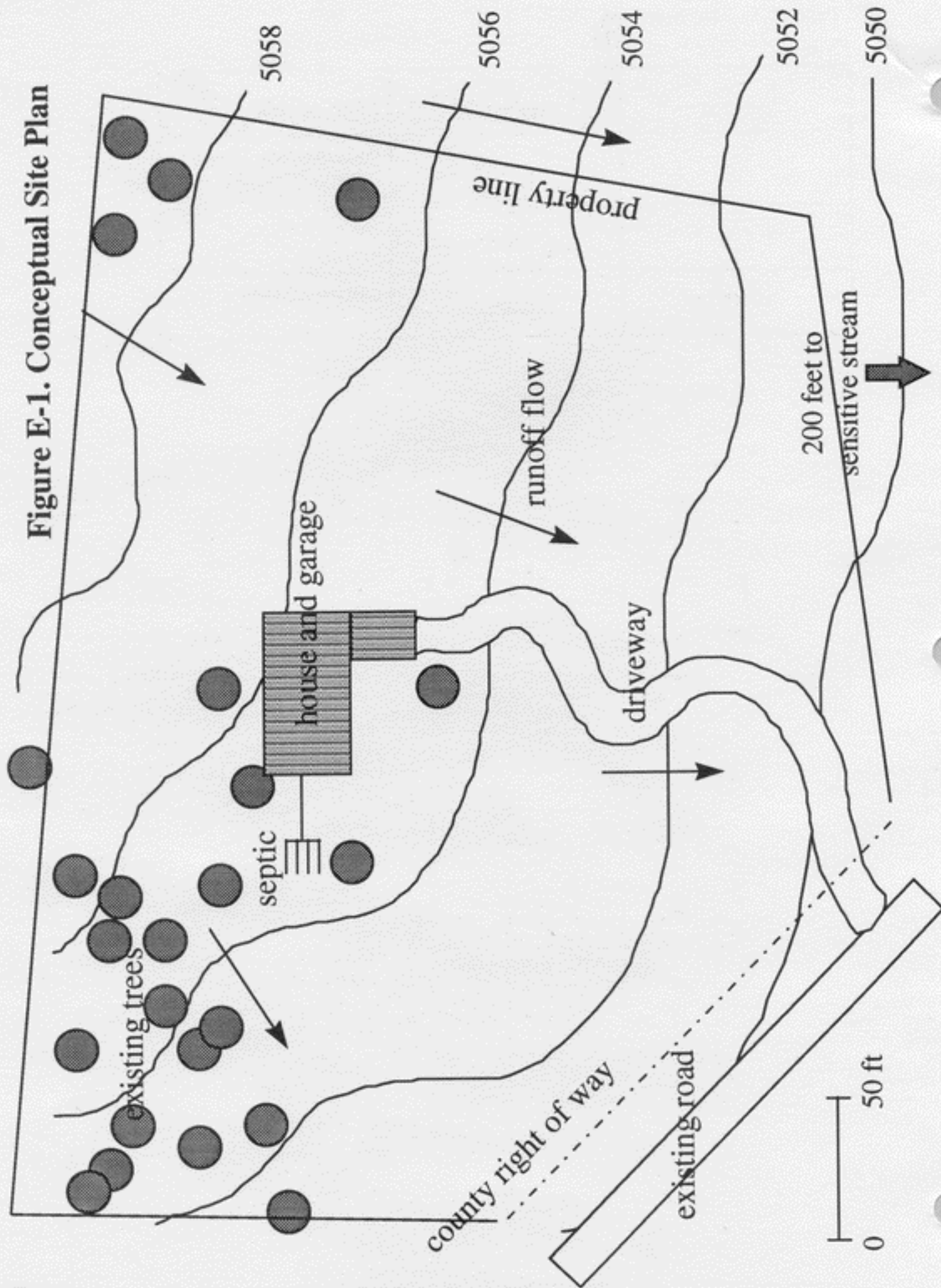
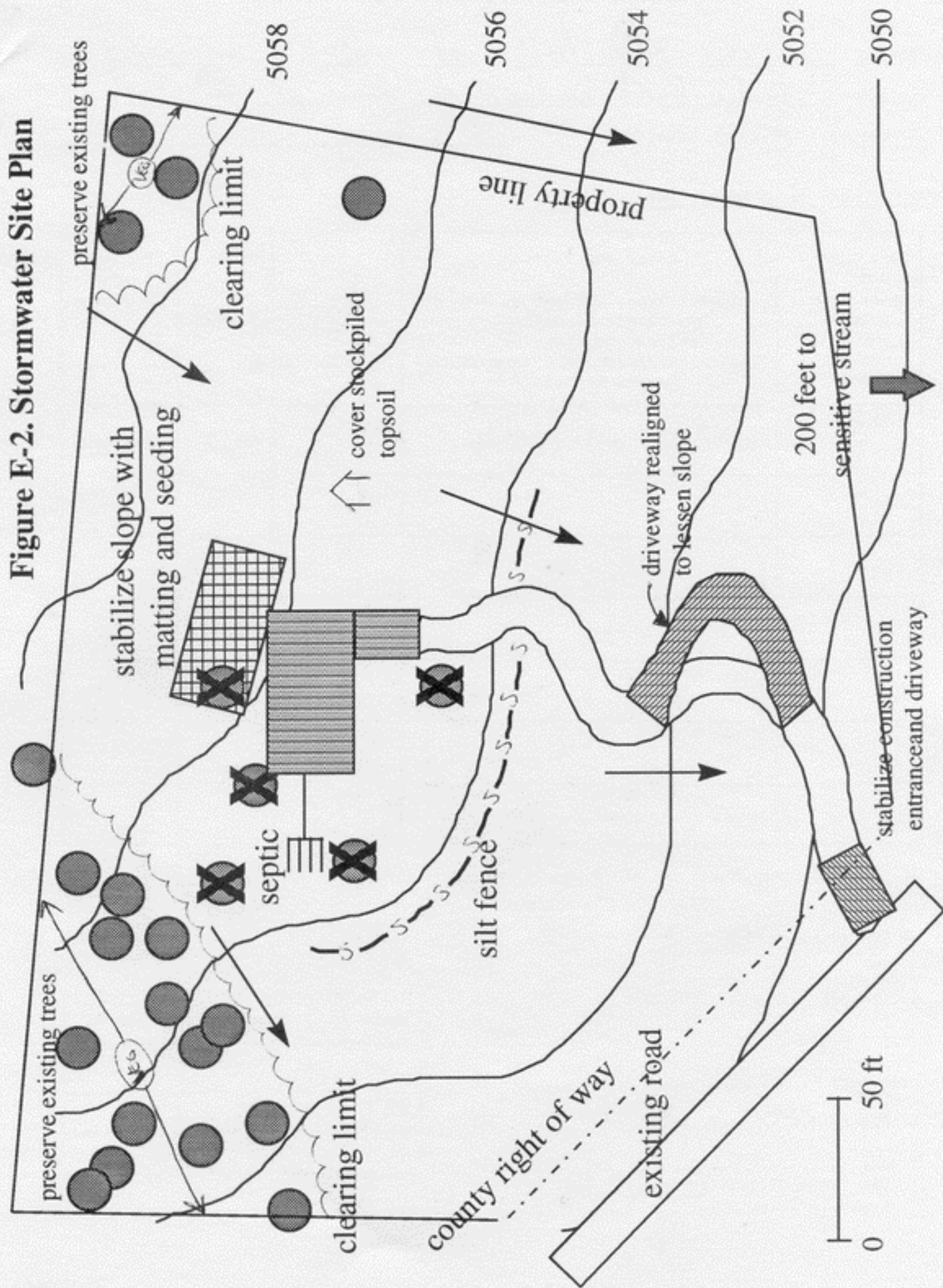


Figure E-2. Stormwater Site Plan



Worksheet 2: Runoff curve number and runoff

Project 24040 Boot Hill Road By DRF Date 1/30/97
 Location Dodge Ranch Development Checked CKB Date 1/30/97
 Circle one: Present Developed 2.3 acres

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
Archibald B	Wooded, good condition	55			100	5500
Totals =					100	5500

1/ Use only one CN source per line.

Totals =

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{5500}{100} = 55$$

Use CN =

55

2. Runoff

Frequency yr

Rainfall, P (24-hour) used Fig D-2 in

Runoff, Q in
 (Use P and CN with table 2-1 fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
5		
.08 x 24 = 1.92		
.02		

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project 24040 Best Hill Road By DRF Date 1/30/97
 Location Dodge Ranch Development Checked GCB Date 1/30/97
 Circle one: Present Developed _____
 Circle one: T_c T_t through subarea _____

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (table 3-1)
2. Manning's roughness coeff., n (table 3-1) ..
 assume light underbrush
3. Flow length, L (total $L \leq 300$ ft) ft
4. Two-yr 24-hr rainfall, P_2 in
5. Land slope, s ft/ft
6. $T_c = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute T_c hr

woods and brush	
0.40	
300	
1.5	
2/10 = 0.03	
1.07	+
	=

Shallow concentrated flow

Segment ID

7. Surface description (paved or unpaved)
8. Flow length, L ft
9. Watercourse slope, s ft/ft
10. Average velocity, V (figure 3-1) ft/s
11. $T_c = \frac{L}{3600 V}$ Compute T_c hr

none	
	+
	=

Channel flow

Segment ID

12. Cross sectional flow area, a ft²
13. Wetted perimeter, p_w ft
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft
15. Channel slope, s ft/ft
16. Manning's roughness coeff., n
17. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V ft/s
18. Flow length, L ft
19. $T_c = \frac{L}{3600 V}$ Compute T_c hr
20. Watershed or subarea T_c or T_t (add T_c in steps 6, 11, and 19) hr

none	
	+
	=
	1.07

Worksheet 4: Graphical Peak Discharge method

Project 24040 Beet Hill Road By DRF Date 1/30/97
 Location Dodge Ranch Development Checked OKF Date 1/30/97
 Circle one: Present Developed _____

1. Data:

Drainage area $A_m = 0.0036$ mi² (acres/640)
 Runoff curve number CN = 55 (From worksheet 2),
 Time of concentration .. $T_c = 1.07$ hr (From worksheet 3),
 Rainfall distribution type = II (I, IA, II, III)
 Pond and swamp areas spread throughout watershed = 0 percent of A_m (____ acres or mi² covered)

2. Frequency

yr

3. Rainfall, P (24-hour)

in

4. Initial abstraction, I_a
 (Use CN with table 4-1.)

in

5. Compute I_a/P

6. Unit peak discharge, q_u
 (Use T_c and I_a/P with exhibit 4-II)

csm/in

7. Runoff, Q
 (From worksheet 2). Figure 2-6

in

8. Pond and swamp adjustment factor, F_p
 (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)

9. Peak discharge, q_p
 (Where $q_p = q_u A_m Q F_p$)

cfs

$$q_p = 100 \times 0.0036 \times 0.02 \times 1.0$$

Storm #1	Storm #2	Storm #3
5		
1.92		
1.636		
0.85		
100		
0.02		
1.0		
0.0072		

Figure 4-2.—Worksheet 4 for example 4-1.

Worksheet 2: Runoff curve number and runoff

Project 24040 Boot Hill Road By DRF Date 1/30/97
 Location Dodge Ranch Development Checked CXB Date 1/31/97
 Circle one: Present Developed 2.3 acres

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
Archibald B	2+ acre residential	65			100	6500
Totals =					100	6500

^{1/} Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{6500}{100} = 65; \quad \text{Use CN} = \boxed{65}$$

2. Runoff

Frequency yr
 Rainfall, P (24-hour) in
 Runoff, Q in
 (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
5		
1.92		
0.14		

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project 24040 Boot Hill Road By DRF Date 1/30/97
 Location Dodge Ranch Development Checked KLB Date 1/30/97
 Circle one: Present Developed
 Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (table 3-1)
2. Manning's roughness coeff., n (table 3-1) ..
assume short grass prairie
3. Flow length, L (total $L \leq 300$ ft) ft
4. Two-yr 24-hr rainfall, P_2 in
5. Land slope, s ft/ft
6. $T_c = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute T_c hr

short grass prairie	
0.15	
300	
1.5	
2/10 = .03	
0.49	+

$$T_t = \frac{0.007(0.15 \times 300)^{0.8}}{1.5^{0.5} \times 0.03^{0.4}}$$

= 0.49

Shallow concentrated flow

Segment ID

7. Surface description (paved or unpaved)
8. Flow length, L ft
9. Watercourse slope, s ft/ft
10. Average velocity, V (figure 3-1) ft/s
11. $T_c = \frac{L}{3600 V}$ Compute T_c hr

none	
	+

=

Channel flow

Segment ID

12. Cross sectional flow area, a ft²
13. Wetted perimeter, p_w ft
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft
15. Channel slope, s ft/ft
16. Manning's roughness coeff., n
17. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V ft/s
18. Flow length, L ft
19. $T_c = \frac{L}{3600 V}$ Compute T_c hr
20. Watershed or subarea T_c or T_t (add T_c in steps 6, 11, and 19) hr

	+

= 0.49

Worksheet 4: Graphical Peak Discharge method

Project 24040 Boot Hill Road By DRF Date 1/30/97
 Location Dodge Ranch Development Checked CRB Date 1/30/97
 Circle one: Present Developed

1. Data:

Drainage area $A_m = 0.0036$ mi^2 (acres/640)
 Runoff curve number $CN = 65$ (From worksheet 2),
 Time of concentration .. $T_c = 0.5$ hr (From worksheet 3),
 Rainfall distribution type = II (I, IA, II, III)
 Pond and swamp areas spread
 throughout watershed = 0 percent of A_m (____ acres or mi^2 covered)

- | | Storm #1 | Storm #2 | Storm #3 |
|---|----------|----------|----------|
| 2. Frequency yr | 5 | | |
| 3. Rainfall, P (24-hour) in | 1.92 | | |
| 4. Initial abstraction, I_a in
(Use CN with table 4-1.) | 1.077 | | |
| 5. Compute I_a/P | 0.56 | | |
| 6. Unit peak discharge, q_u csm/in
(Use T_c and I_a/P with exhibit 4-II) | 200 | | |
| 7. Runoff, Q in
(From worksheet 2). Figure 2-6 | 0.14 | | |
| 8. Pond and swamp adjustment factor, F_p
(Use percent pond and swamp area
with table 4-2. Factor is 1.0 for
zero percent pond and swamp area.) | 1.0 | | |
| 9. Peak discharge, q_p cfs
(Where $q_p = q_u A_m Q F_p$) | 0.1 | | |
- $q_p = 200 \times 0.0036 \times 0.14 \times 1.0$

Figure 4-2.—Worksheet 4 for example 4-1.